SCIENTIFIC SERIALS

Zeitschrift der Oesterreichischen Gesellschaft für Meteorologie, April.—This number contains an article by Signor Denza, director of the Observatory at Moncalieri, on an inspection by him of observatories of the second order, according to the recommendations of the Leipzig and Vienna Conferences, for the correction of barometers. He has found that a safe verification can only be made when all the rules and precautions are observed, and recommends that the barometer taken in travelling from place to place should not be too narrow in bore, and should be carefully compared with the standard before and after the journey.—The next article is by Dr. Hann, on the results of observations made by the Swedish Arctic Expedition of 1872 in Spitzbergen and East Greenland, published in Stockholm. The observations are of great value, and deserve the full notice here given them by Dr. Hann.

Reale Istituto Lombardo di Scienze e Lettere. Rendiconti. Vol. IX. Nos. 1, 2, 3 (1876). Among the papers contained in these numbers we note the following:—Singular structure of the leaves in the Empetroceæ, by M. Gibelli.—Sketch of Dr. Cantor's recent studies on the history of land-surveying, by M. Schiaparelli.—Researches on the action of oxygen, at the ordinary temperature on sulphur, on alkaline and terralkaline sulphides, and on hyposulphite of calcium, by M. Pellogio.—Report on the vine-disease of Phylloxera, by a Committee of the Institute.—On a new disease of chestnuts, by M. Gibelli.—On the constitution of veratric acid and veratrol, by M. Körner.—On the temperature of flames, by M. Ferrini.

Gazzetta Chimica Italiana, anno vi., 1876, fasc. iv.—E. Paternò and G. Briosi contribute a paper on hesperidin. These two investigators studied hesperidin derived from the common orange (*Citrus aurantium*, Risso). About 4,000 ripe oranges were found to yield 180 grammes of impure hesperidin. They experienced much difficulty in their endeavours to purify this substance.—G. Pisati contributes the only two original papers in addition to the one we have already noticed. His first paper details some experimental researches made by the author on electro-static induction. The second treats of the elasticity of metals at different temperatures.—The remainder of this number is filled up by summaries of the contents of foreign chemical journals, and a review of a book by T. Schutzenberger, "On Fermentation."

In the *Zeitschrift für Wissenschaftliche Zoologie*, vol. xxvi., part 2 (December, 1875), W. Repiachoff continues his contributions on the Chilostomous Bryozoa, giving many interesting particulars about the development of the amphiblastic ovum of Lepralia and Tendra.—Ludwig Graff describes the anatomy of the Sipunculoid *Chætoderma nitidulum*.—Dr. Hubert Ludwig writes on the interesting Gastrotrichous Rotifers, established as a separate order by Metschnikoff.

SOCIETIES AND ACADEMIES

London

Royal Society, May 18—"The Calculus of Chemical Operations.—Part II. On the Analysis of Chemical Events," by Sir B. C. Brodie, Bart., F.R.S., late Professor of Chemistry in the University of Oxford.

Introduction.—An account is here given of the origin of our views of the constitution of ponderable matter, regarded as constituted of units compounded of "simple weights." These considerations lead to two systems, and two only, in which the unit of hydrogen is respectively expressed by the symbols α and α^2. Between the systems we have no absolute means of selection, but a preference is here given to the system α as immediately leading to the law of even numbers.

The exception presented by the binoxide of nitrogen is then considered, and a hypothesis suggested to account for this anomaly.

The object of the work is then defined—namely, given a chemical event, how are we to determine the events of which it is compounded?

Section I.—The *Question of the Multiplication and Division of Chemical Equations* is here considered. It is shown that we may multiply and divide a chemical equation of the form $u = 0$, by any chemical function, if the sum of the numerical coefficients in that equation is equal to zero, but otherwise not. A method is given by which every chemical equation may be brought under this form. Such an equation is termed a "normal" chemical equation, for it is an equation on which we may operate by the rules of elementary algebra.

It is then shown that every chemical expression of the form $A(x-a)\,y-b$, and also $A(x-a)(y-b)(z-c)\ldots$ (that is, the continued product of any number of such factors more than one), necessarily $= 0$.

As regards the interpretation of normal chemical equations. Normal equations express the identity of the two members of the equation, not only as regards matter, but as regards matter and space also. Thus the equation $1 + 2\alpha\xi = 2\alpha + \xi^2$ asserts not only that the matter of two units of water is identical with the matter of two units of hydrogen and a unit of oxygen, but also that an empty unit of space and the space occupied by two units of water are identical with the space occupied by two units of hydrogen and a unit of oxygen.

It is further shown that in any chemical equation any one of the prime factors of the equation may be substituted for another, and the equation will still be true.

Section II.—Our knowledge of the identity of matter is derived from chemical transmutations or events; and every chemical equation may be regarded as the record of such an event or some number of such events. Chemical events may be regarded as compound or simple. A compound event is defined as an event which is regarded in the system of events under our consideration as constituted of two or more events. A simple event is an event which is not so regarded. Thus, for example, take the system of the four events:—

$$\begin{array}{llll}
(1) & \alpha^2\upsilon + \alpha^3\kappa^2\omega & = \alpha\omega & + \alpha^4\kappa^2\upsilon, \\
(2) & \alpha^4\kappa^2\upsilon + \alpha^3\kappa^2\omega & = \alpha\omega & + \alpha^6\kappa^4\upsilon, \\
(3) & \alpha^6\kappa^4\upsilon + \alpha^3\kappa^2\omega & = \alpha\omega & + \alpha^8\kappa^4\upsilon, \\
(4) & \alpha^2\upsilon + 3\alpha^3\kappa^2\omega & = 3\alpha\omega & + \alpha^8\kappa^6\upsilon.
\end{array}$$

The event 4 is a compound event, being the aggregate of the events 1, 2, 3; whereas the events 1, 2, 3 are in that system simple events, being incapable of such a construction.

Section III.—*On the Causes of Events.*—The cause of an event is given when the operations are defined by the agency of which the event occurs. *Def.* If in any chemical event the change in the arrangement of the symbols, by which the composition of the units of matter before and after the event respectively is symbolised, be of such a nature that where in the arrangement before the event the symbol x appears, the symbol a appears after the event, and where a appears before x appears after, so that the two arrangements differ in this respect and this respect alone, then the event occurs by the substitution of a for x, which is the "cause" of the event. Hence the same event may arise from more than one cause. Thus, for example, the event

$$Ayx + Aab = Aya + Axb$$

occurs by the substitution of a for x and of b for y, for these symbols satisfy the condition given in the above definition.

It is similarly shown that the event

$$Axyz + Aabz + Aayc + Axbc = Axyc + Aabc + Aayz + Axbz$$

occurs by the substitution of a for x, b for y, z for c; and, further, that if the equation to any chemical event be of the form $A(x-a)(y-b)(z-c)(v-d)(w-e)\ldots = 0$, that event occurs by the substitutions of a for x, b for y, c for z, d for v, e for w . . . .

If in these substitutions any symbol, say "a" $= 1$, the event occurs by the transference of the simple weight thus symbolised.

The following event occurs in three ways by the substitution of ξ for χ, the hydride of propyl, $\alpha^4\kappa^3$, being constant,

$$\alpha^4\kappa^3\chi^3 + 3\alpha^4\kappa^3\xi^2\chi = \alpha^4\kappa^3\xi^3 + 3\alpha^4\kappa^3\xi^2\chi,$$

the equation being of the form

$$\alpha^4\kappa^3(\chi - \xi)^3 = 0.$$

Similarly the event

$$\alpha^2\kappa\chi^3 + 3\alpha^2\kappa\chi = 3\alpha^2\kappa\chi^2 + \alpha^2\kappa$$

is an event occurring in three ways by the transference of χ, the equation being of the form

$$\alpha^2\kappa(\chi - 1)^3 = 0.$$

I submit the following equation to the consideration of the reader:—

$$\alpha^4\kappa^3\xi(\beta - \xi)(\alpha\kappa^2\xi - 1) = 0.$$

Section IV. *Elementary Analysis of Events.*—If the equation to a chemical event be capable of expression as the continued

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product of rational factors of the form previously given $(x - a)$, x and a being prime factors of the equation, the event is a simple event incapable of further resolution; but occasionally the equations to events may be expressed by rational factors, although not of this form. In this case they admit of an easy analysis into other events of which they are the aggregates. Take, for example, the equation

$$\alpha\chi^2 + 2\alpha\omega = 2\alpha\chi + \alpha\omega^2,$$

which may be written thus,

$$\alpha(\chi - 1)(\chi - \omega) + \alpha(\omega - 1)(\chi - \omega) = 0,$$

whence

$$\alpha(\chi - 1)(\chi - \omega) = 0,$$
$$\alpha(\omega - 1)(\chi - \omega) = 0,$$

the constituents being

$$\alpha\chi^2 + \alpha\omega = \alpha\chi + \alpha\omega\chi,$$
$$\alpha\omega\chi + \alpha\omega = \alpha\omega^2 + \alpha\chi,$$

Again, the following event is the action of chlorosulphuric acid upon water:—

$$\alpha\theta\xi^2\chi^2 + 2\alpha\xi = \alpha\theta\xi^4 + 2\alpha\chi.$$

This equation is of the form

$$\alpha(\theta\xi^2 + \theta\xi^3 - 2)(\chi - \xi),$$

whence

$$\alpha(\theta\xi^2\chi - 1)(\chi - \xi) + \alpha(\theta\xi^3 - 1)(\chi - \xi),$$

the constituents being

$$\alpha\theta\xi^2\chi^2 + \alpha\xi = \alpha\theta\xi^3\chi + \alpha\chi,$$
$$\alpha\theta\xi^3\chi + \alpha\xi = \alpha\theta\xi^4 + \alpha\chi,$$

The analysis of these two phenomena here indicated has actually been effected by experiment.

Section V.—In this section the doctrine of *Chemical Congruity* is discussed, two chemical functions being said to be congruous to one another in reference to a special substitution if they assume the same value when that substitution is respectively effected in them.

Further, a method is given for the *Development of Chemical Functions*, and for the complete theoretical analysis of any chemical event whatsoever—the theoretical analysis of a chemical event occurring by any number of specified substitutions, namely, of a for x, b for y, c for z, ..., being here said to be effected when all the different chemical events occurring in any way whatever by these substitutions are enumerated, the aggregate of which constitutes the event in question.

PARIS

Academy of Sciences, July 31.—Vice-Admiral Paris in the chair.—The following papers were read:—On the carpellary theory according to the Loaseæ (first part: Mentzelia), by M. Trécul.—Oscillations of temperature of half May, half June, and half July, 1876; non-synchronic parallelism of the barometric pressure and the temperature, by M. Sainte-Claire Deville. A minimum of temperature on the 10th, 11th, and 12th respectively; and maxima, on either hand, about the 7th and the 16th.—Fifth note on electrical transmissions through the ground, by M. du Moncel. The conductivity of hard stones, as also, doubtless, that of the ground, with regard to plates buried in it, is far from being uniform throughout their mass. The metals used as electrodes with his silex may be ranked thus as to electromotive force, each being electro-negative to those which follow—platina, copper, brass, iron, tin, lead, zinc.—Researches on the development of the chestnut, by M. Baillon. These throw some light on the disputed point of development of the cupule in the acorn.—On the disease called diarrhœa of Cochin China, by M. Normand. It has wrought great havoc among the troops there. It is caused by a parasitical worm in the tissues of the intestine. Milk has been the best remedy hitherto.—On the general theory of regulators, by M. Wischnegradski.—On globular lightning, by M. Planté. He describes a case of it at Paris, July 24. He thinks it due to spherical aggregation of air and steam through suction and rarefaction by the electric fluid, and condensation of positive electricity in this envelope of rarefied matter.—Radiometer with vanes formed of a metal and of unblackened mica, by MM. Alvergniat Frères. On heating and exhausting to a certain point, it became very little sensitive to light; would only turn with sunlight; but it had great sensibility to obscure heat.—Observations on vines having galls in large quantities, by M. Laliman.—New confirmation of phylloxerian migrations, by M. Lichtenstein.—Nebulæ discovered and observed at Marseilles Observatory, by M. Stephan Twenty-three are described.—Note on dissociation of the vapour of calomel, by M. Debray. Calomel undergoes a commencement of decomposition at 440°. He heated it in a platinum tube, and held in the vapour a U-tube of gilt silver, through which circulated cold water. There was a greyish deposit containing a little mercury so divided in a fine powder of calomel that it could not attack the gold.—On the laws of compressibility and the coefficients of dilatation of some vapours.—Action of hydracids on tellurous acid, by M. Ditte.—On new salts of bismuth and their use in testing for potash, by M. Carnot. These are distinguished by their complete solubility in water. They are double hyposulphites of bismuth and of alkalies.—On the isomery of rotatory power in the camphols, by M. de Montgolfier.—On a case of spontaneous alteration of anhydrous hydrocyanic acid, and a new case of total transformation of this acid, by M. de Girard.—On the decomposition of cyanide of potassium, cyanide of zinc, and formiate of potash into carbonic acid, air, and pure hydrogen, by MM. Naudin and Montholon.—On two new sulphurised ureas, by MM. de Clermont and Wehrlin.—On the industrial employment of vanadium in manufacture of aniline black, by M. Witz. This proves a simpler and more economical mode of preparation.—On the manufacture of dynamite, by M. Sobrero. He recommends moulding the siliceous matter, after moistening with water, into blocks, then drying, then dipping slowly in the liquid. He experimented thus with fossil meal of Santa Fiora and olive oil, and was convinced that dynamite with 75 per cent. of explosive matter could be made by this method; danger from friction is avoided.—On the agronomic map of the Arrondissement of Rethel (Ardennes), by MM. Meugy and Nevoit.—On fermentation of fruits placed in carbonic acid, by MM. Joubert and Chamberland.—Cellulosic fermentation by means of vegetal organs, and probable utilisation of the sugar in the vegetation for the formation of cellulose, by M. Durin.—On the microzymes of germinated barley and sweet almonds as producers of diastase and synaptase (*àpropos* of note by MM. Pasteur and Joubert), by M. Bechamp.—Rectification in a former note on panification in the United States, and the properties of hops as ferment, by M. Sacc.—On the fermentation of urine, *àpropos* of a communication of M. Pasteur, by Dr. Bastian. Boiled solution of potash can fertilise sterile urine only when used in a proportion corresponding to the acidity and quantity of the liquid. The author asks M. Pasteur for direct proof that germs of Bacteria can survive in a liquid as caustic as the solution of potash made in the pharmaceutical proportions, when it is raised even for only a few instants, to 100°.—Observations on opinions attributed by Prof. Bastian to Prof. Tyndall, *àpropos* of the doctrine of spontaneous generation; extracts from two letters from Prof. Tyndall. He expresses surprise at being cited as guaranteeing the exactness of Dr. Bastian's experiments, and his entire concurrence with M. Pasteur.—On metallic powders in the atmosphere, by M. Phipson.

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